Software

PVM Wrapper

PVM Wrapper is a software library that makes it possible for code that utilizes the Parallel Virtual Machine (PVM) software library to run using the message-passing interface (MPI) software library, without needing to rewrite the entire code. PVM and MPI are the two most common software libraries used for applications that involve passing of messages among parallel computers. Since about 1996, MPI has been the the de facto standard. Codes written when PVM was popular often feature patterns of {"init-send," "pack," "send"} and {"receive," "unpack"} calls. In many cases, these calls are not contiguous and one set of calls may even exist over multiple subroutines. These characteristics make it difficult to obtain equivalent functionality via a single MPI "send" call. Because PVM Wrapper is written to run with MPI-1.2, some PVM functions are not permitted and must be replaced — a task that requires some programming expertise. The "pvm_spawn" and "pvm_parent" function calls are not replaced, but a programmer can use "mpirun" and knowledge of the ranks of parent and child tasks with supplied macroinstructions to enable execution of codes that use "pvm_spawn" and "pvm_parent."

This program was written by Daniel Katz of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

This software is available for commercial licensing. Please contact Don Hart of the California Institute of Technology at (818) 393-3425. Refer to NPO-40232.

Simulation of Hyperspectral Images

A software package generates simulated hyperspectral imagery for use in validating algorithms that generate estimates of Earth-surface spectral reflectance from hyperspectral images acquired by airborne and spaceborne instruments. This software is based on a direct simulation Monte Carlo approach for modeling three-dimensional atmospheric radiative transport, as well as reflections from surfaces characterized by spatially inhomogeneous bidirectional reflectance distribution functions. In this approach, "ground truth" is accurately known through input specification of surface and atmospheric properties, and it is practical to consider wide variations of these properties. The software can treat both land and ocean surfaces, as well as the effects of finite clouds with surface shadowing. The spectral/spatial data cubes computed by use of this software can serve both as a substitute for, and a supplement to, field validation data.

This program was written by Steven C. Richtsmeier, Alexander Singer-Berk, and Lawrence S. Bernstein of Spectral Sciences, Inc., for **Stennis Space Center**.

Inquiries concerning rights for the commercial use of this invention should be addressed to the Intellectual Property Manager, Stennis Space Center, (228) 688-1929. Refer to SSC-00183.

Algorithm for Controlling a Centrifugal Compressor

An algorithm has been developed for controlling a centrifugal compressor that serves as the prime mover in a heat-pump system. Experimental studies have shown that the operating conditions for maximum compressor efficiency are close to the boundary beyond which surge occurs. Compressor surge is a destructive condition in which there are instantaneous reversals of flow associated with a high outlet-to-inlet pressure differential. For a given cooling load, the algorithm sets the compressor speed at the lowest possible value while adjusting the inlet guide vane angle and diffuser vane angle to maximize efficiency, subject to an overriding requirement to prevent surge. The onset of surge is detected via the onset of oscillations of the electric current supplied to the compressor motor, associated with surge-induced oscillations of the torque exerted by and on the compressor rotor. The algorithm can be implemented in any of several computer languages.

This program was written by Scott M. Benedict of Mainstream Engineering Corp. for **Johnson Space Center**. *For further information, contact:*

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